(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
15 August 2002 (15.08.2002)

PCT

(10) International Publication Number
WO 02/062459 A1

(51) International Patent Classification[7]: B01F 15/04, F04C 2/344, A22C 11/08

(21) International Application Number: PCT/NL02/00085

(22) International Filing Date: 6 February 2002 (06.02.2002)

(25) Filing Language: Dutch

(26) Publication Language: English

(30) Priority Data:
1017295 6 February 2001 (06.02.2001) NL

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 02/062459 A1

(54) Title: DIVIDING DEVICE

(57) Abstract: The invention relates to a dividing device, comprising at least one vane-type rotor (6) comprising a hub (8) provided with contin uous vanes (7) which are slidable through the hub along their lo ngitudinal axis and almost perpendicular to the axis of the hub, the hub being provided with axial grooves for holding the continuous vanes which grooves partially divide the hub in sections, a part of the sections being provided with an aperture (9) axially through the hub, for providing a means for connecting several vane-type rotors to each other, the apertures being unround.

Dividing device

The invention relates to a dividing device.

It is common practice to supply a flow of material, preferably dough material or minced meat or stuffing for croquettes and the like, by means of a vacuum fill machine to a dividing device. As the vacuum fill machine is an expensive machine, it is preferred to provide the vacuum fill machine with a dividing device, in which the flow of material is first divided into several as identical as possible flows and which are subsequently, dependently or independently from each other, divided into portions. It is desirable that the size and weight of the portions are repeated as accurately as possible. In many production situations it is desirable to keep the standard deviation between the portions as small as possible.

From for instance WO-A2-98/22206 a dividing device is known provided with a device for converting one flow of material into several flows, in which the device has been provided with a vane-type rotor. A drawback of the embodiment described however is that very large standard deviation appeared to occur in the size of the flows and thus the portions, particularly in case of viscous materials.

It is an object of the invention to overcome the drawbacks mentioned. To that end the invention relates to a dividing device, comprising at least one vane-type rotor comprising a hub provided with continuous vanes which are slidable through the hub along their longitudinal axis and almost perpendicular to the axis of the hub, the hub being provided with axial grooves for holding the continuous vanes which grooves partially divide the hub in sections, a part of the sections being provided with an aperture

axially through the hub, for providing a means for connecting several vane-type rotors to each other, the apertures being unround.

It has appeared that by using unround apertures the standard deviation between the size of the portions could be reduced for a large part.

A further reduction in the standard deviation could be realised when the apertures at the inside comprised at least one flat surface plane. Preferably the apertures have a polygonal cross-section, preferably square or triangular.

To reduce wear and tear and to further reduce standard deviation it is preferred that the hub is provided with a metal hood at the side opposite the grooves. In most embodiments the hub will be made of synthetic material, such as for instance nylon. The slidable vanes will then for instance be made of stainless steel. In most case the metal hood is made of stainless steel as well, in connection with the corrosion and the requirements in the food industry.

In a preferred embodiment the vane-type rotor is provided with six vanes, the vanes preferably being built from three continuous vane elements which are slidable in the hub in the grooves perpendicular to the longitudinal axis of the hub.

An embodiment for realising the slidable vanes regards one in which two vane elements in the centre are provided with a recess on at least one longitudinal side and the third vane element is provided with recesses on both longitudinal sides, the addition sum of the depths of the recesses being at least equal to the width of a vane element.

Preferably the smallest width of the recesses is equal to the minimal protrusion of the vanes.

Preferably the largest width of the recesses is smaller or equal to the radius of the hub increased by the thickness of the vane elements.

Additionally the invention relates to a dividing device provided with at least one inlet and at least two outlets and a housing provided with a chamber connected to the inlets and the outlets, and in which at least two vane-type rotors have been rotatably arranged, the vane-type rotors being provided with axial, unround apertures for connecting the vane-type rotors one to the other by means of connectors so that the vane-type rotors form one rotatable unity.

In such a dividing device particularly the vane-type rotors are preferably provided with vane elements running through the hub which elements are slidable longitudinally along their axis and perpendicular to the axis of the hub through the hub.

Additionally the invention relates to a dividing device provided with at least one inlet and at least two outlets and a housing provided with a chamber connected to the inlet or inlets and to the outlets, and in which at least one vane-type rotor has been rotatably arranged, the vane-type rotor being provided with a synthetic hub and vane elements running through the synthetic hub which elements are slidable longitudinally along their axis and perpendicular to the axis of the synthetic hub, the synthetic hub being provided with a metal hood.

In particular the hub is provided with axial grooves that partly divide the hub into sections, and the hub is provided with the metal hood at the side opposite the side provided with the grooves.

Additionally the invention relates to a vane-type rotor, suitable for a device as described above in the text.

Said aspects of the invention can be combined if so desired.

The invention will be further elucidated on the basis of an exemplary embodiment of a dividing device according to the invention, in which:

Figure 1 shows a dividing device according to the invention;

Figure 2 shows a segment of the housing including vane-type rotor;

Figure 3 shows a vane-type rotor according to one aspect of the invention;

Figure 4 shows two connected hubs;

Figure 5 shows vane elements according to an aspect of the invention;

Figure 6 shows a longitudinal section of a hub according to the invention;

Figure 7 shows a cross-section of the metal hood of the hub according to an aspect of the invention;

Figure 8 shows a bottom view of a hub according to the invention; and

Figure 9 shows a top view of a hub according to the invention at the side of the metal hood.

Figure 1 shows a device for processing among other meat dough, provided with a dividing device 1 according to the invention, a vacuum fill machine 2, connected to an inlet opening of the dividing device 1 and a discharge device 3 for discharge of the various flows of material coming out of the outlet openings of the dividing device 1. The dividing device 1 is provided with various segments 4.

Figure 2 shows a segment 4 of the dividing device 1 as can be seen in figure 1. Each segment is provided with a housing 5 in which a vane-type rotor 6. The vane-type rotor 6 is provided with vanes 7 that are movable in a hub 8, longitudinally with respect to the axis of rotation of the vane-type rotor. The hub is provided with unround apertures 9. The hub is divided into sections 10 by axial grooves. Generally the hub is made of a synthetic material such as nylon.

Figure 3 shows the vane-type rotor 6 according to the invention in detail. In the figure it can clearly be seen that the vane-type rotor 6 comprises a hub 8 provided with axial grooves 12 that partially divide the hub into sections 10. A part of those sections 10 is here provided with unround apertures 9 that have been provided with a flat surface plane 11. In this exemplary embodiment the apertures are square. The vanes 9 can move longitudinally in the axial grooves. Generally the vanes are made of metal, preferably stainless steel.

Figure 4 Shows how various hubs 8 of the dividing device 6 can be placed onto each other for forming one continuous hub. Here connection elements, such as bolts or pins, are inserted through the apertures 9, for connecting the various hubs one to the other. The shape of the bolts is adjusted here to the cross-section of the apertures. Preferably the connection elements exactly fit in the apertures.

Figure 5 shows the vanes 7 of the vane-type rotor 6 according to the invention. It can clearly be seen that the vanes 7 consist of continuous vane elements 14 that have ben provided with recesses 15, that are arranged in the continuous vane elements 14 in such a way that the vanes can slide longitudinally, that means perpendicular to the axis of rotation of the vane-type rotor. In the figure three vane elements are shown but two vane elements forming four vanes can also be used.

Figure 6 shows the hub 8 of a vane-type rotor 6 according to the invention. The grooves 12 can clearly be seen here and continuous unround apertures 9 indicated by dots. The hub 8 here is provided with a metal hood 13 according to a special embodiment of the invention, which hood 13 in this embodiment is provided with pin-shaped protrusions which correspond to the unround apertures for the connection in a mutual engaging manner of the vane-type rotor of the several vane-type rotors of the various segments. It should be clear that the unround apertures 9 need not run through the entire hub 8. An advantage of this is a simpler assembling and disassembling, among others for cleaning, and no separate extra parts.

Figure 7 shows a cross-section of the metal hood 13 provided with the pin-shaped protrusions 16.

Figure 8 shows a bottom view of the hub 8 of a vane-type rotor 6 according to the invention. The axial grooves 12 can clearly be seen as well as the apertures 9 provided with the flat surface planes 11, in this case square apertures. The axial grooves 12 divide the hub 8 into sections 10. The grooves do not entirely run lengthwise through the hub. As can also be seen in figure 6. In this example all sections have been provided with apertures for providing large torsion rigidity.

Figure 9 shows a top view of the metal hood 13 of figure 7. The synthetic hub 8 with the axial grooves 12 is indicated by dots. In this figure it can clearly be seen that the pin-shaped protrusions 16 have a square shape and as a result correspond to the square apertures 9 as indicated in the bottom view of figure 8.

The operation of the dividing device is as follows. A fill machine guides dough material via at least one inlet opening into the dividing device. As a result of the often high pressure, up to over 50 bar, the flow of dough sets

the vane-type rotor in motion and the vane-type rotors start rotating. As a result a constant flow of dough is ensured.

When rotating the vane-type rotors the vane elements move longitudinally and a vane will at some moment during a revolution be entirely accommodated in the hub, and during a later moment protrude maximally out of the hub.

Claims

1. Dividing device, comprising at least one vane-type rotor comprising a hub provided with continuous vanes which are slidable through the hub along their longitudinal axis and almost perpendicular to the axis of the hub, the hub being provided with axial grooves for holding the continuous vanes which grooves partially divide the hub in sections, a part of the sections being provided with an aperture axially through the hub, for providing a means for connecting several vane-type rotors to each other, the apertures being unround.

2. Dividing device according to claim 1, the apertures at the inside comprising at least one flat surface plane.

3. Dividing device according to claim 1 or 2, the apertures having a polygonal cross-section, preferably square or triangular.

4. Dividing device according to one or more of the preceding claims, the hub being provided with a metal hood at the side opposite the grooves.

5. Dividing device according to one or more of the preceding claims, the vane-type rotor being provided with six vanes.

6. Dividing device according to claim 5, the vanes being built from three continuous vane elements which are slidable in the hub in the grooves perpendicular to the longitudinal axis of the hub.

7. Dividing device according to claim 6, two vane elements in the centre being provided with a recess on at least one longitudinal side and the third

vane element being provided with recesses on both longitudinal sides, the addition sum of the depths of the recesses being at least equal to the width of a vane element.

8. Dividing device according to claim 7, the smallest width of the recesses being equal to the minimal protrusion of the vanes.

9. Dividing device according to claim 7 or 8, the largest width of the recesses being smaller or equal to the radius of the hub increased by the thickness of the vane elements.

10. Dividing device provided with at least one inlet and at least two outlets and a housing provided with a chamber connected to the inlets and the outlets, and in which at least two vane-type rotors have been rotatably arranged, the vane-type rotors being provided with axial, unround apertures for connecting the vane-type rotors one to the other by means of connectors so that the vane-type rotors form one rotatable unity.

11. Dividing device according to claim 10, the vane-type rotors being provided with vane elements running through the hub which elements are slidable longitudinally along their axis and perpendicular to the axis of the hub through the hub.

12. Dividing device provided with at least one inlet and at least two outlets and a housing provided with a chamber connected to the inlet or inlets and to the outlets, and in which at least one vane-type rotor has been rotatably arranged, the vane-type rotor being provided with a synthetic hub and vane elements running through the synthetic hub which elements are slidable longitudinally along their axis and perpendicular to the axis of the synthetic hub, the synthetic hub being provided with a metal hood.

13. Vane-type rotor, suitable for a device according to any one of the

preceding claims.

14. Device comprising one or more of the characterizing measures described in the description and/or shown in the drawings.

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15. Method comprising one or more of the characterizing measures described in the description and/or shown in the drawings.

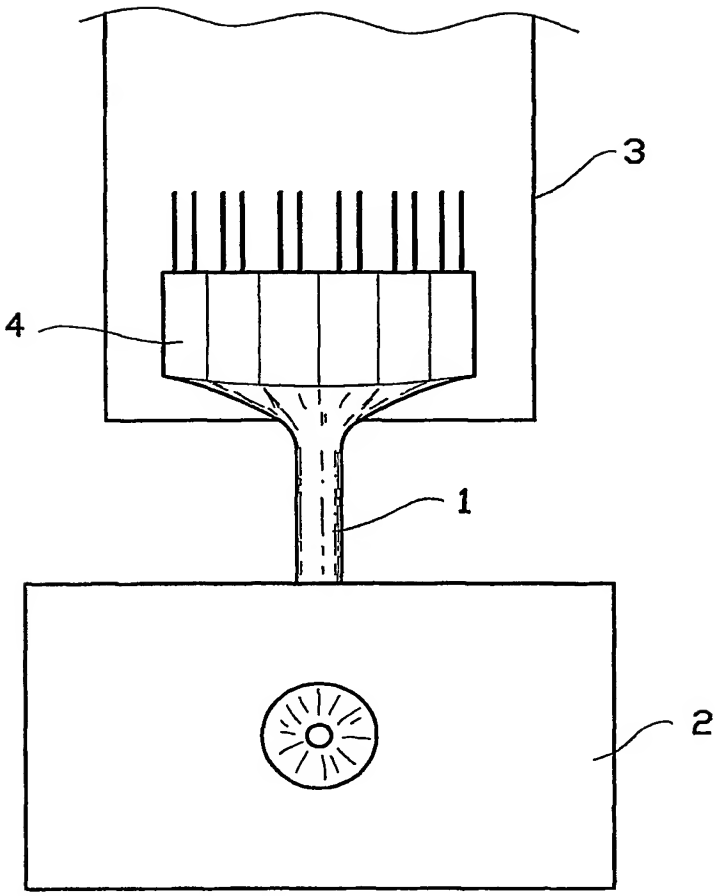

FIG. 1

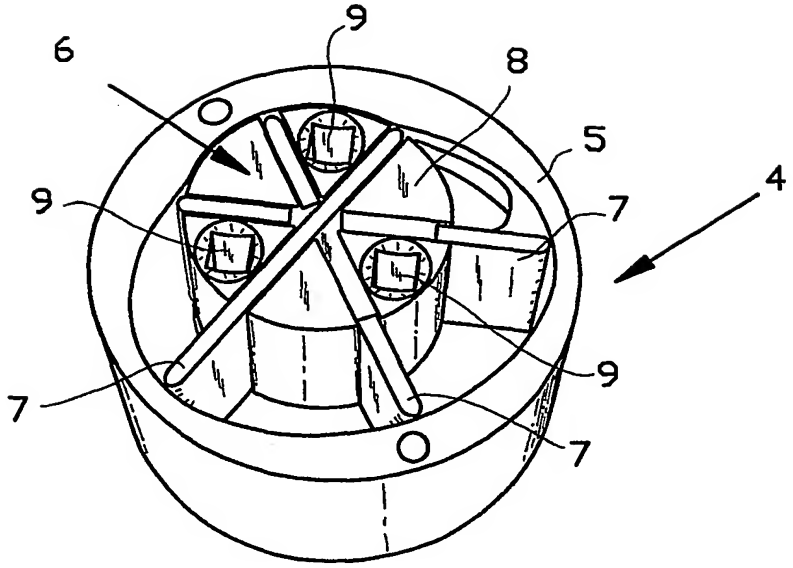

FIG. 2

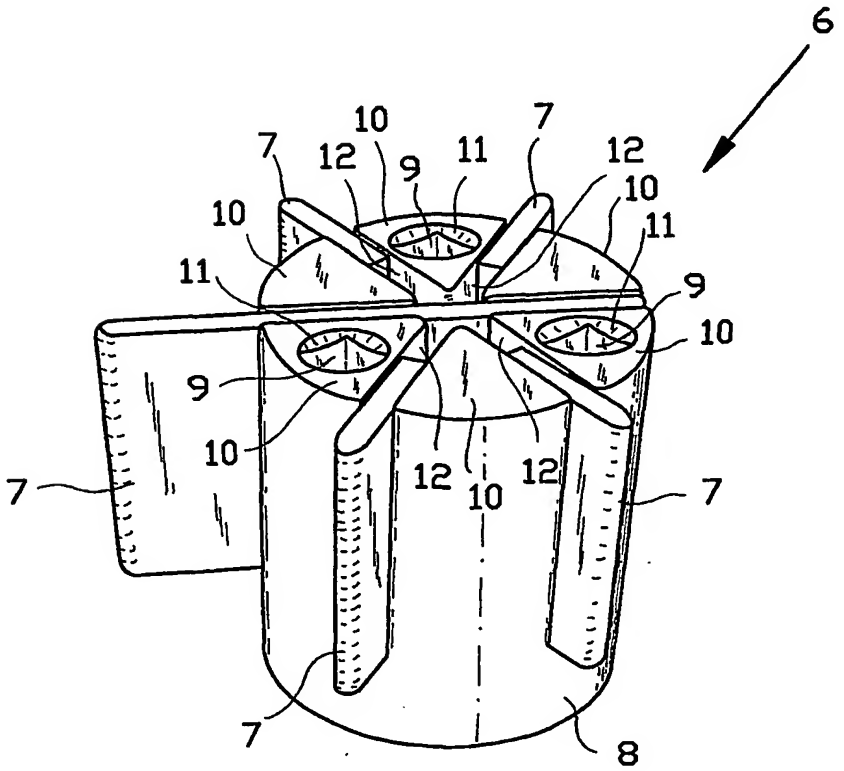

FIG. 3

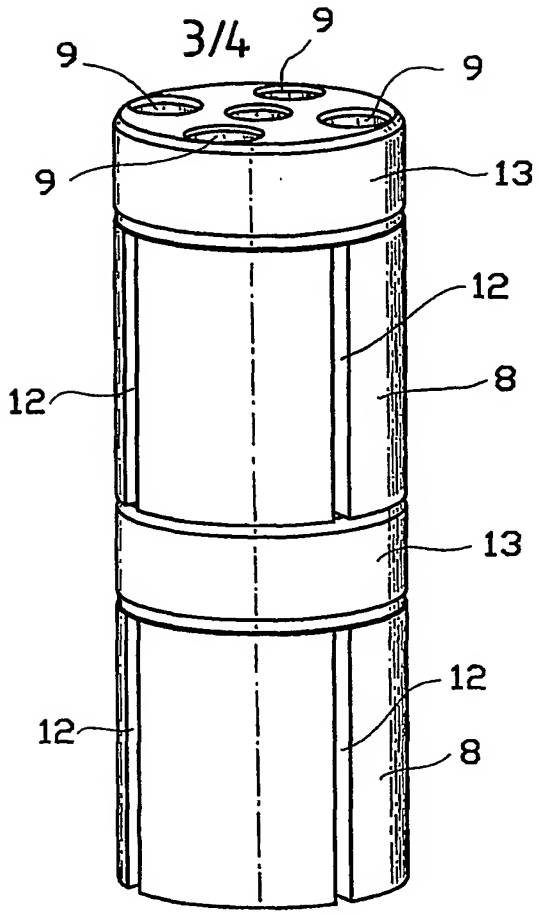

FIG. 4

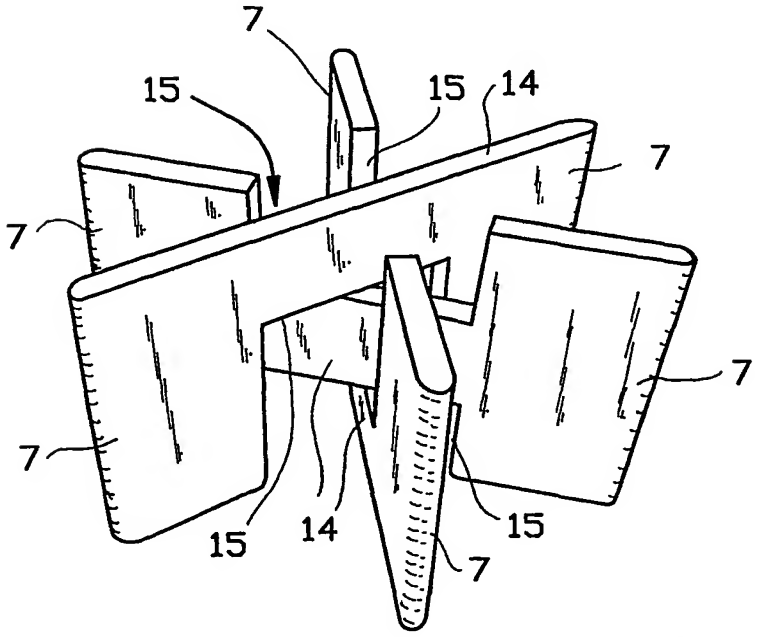

FIG. 5

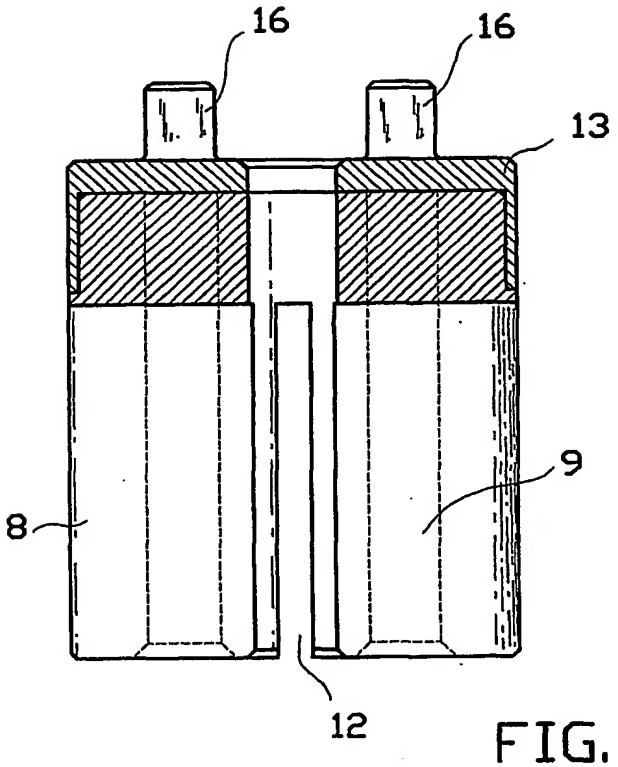

FIG. 6

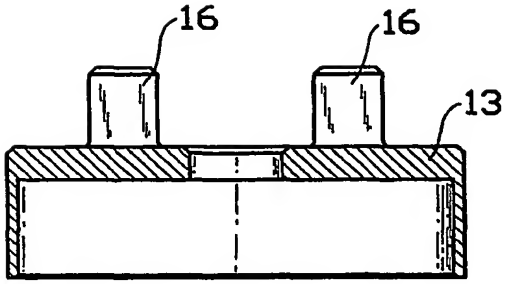

FIG. 7

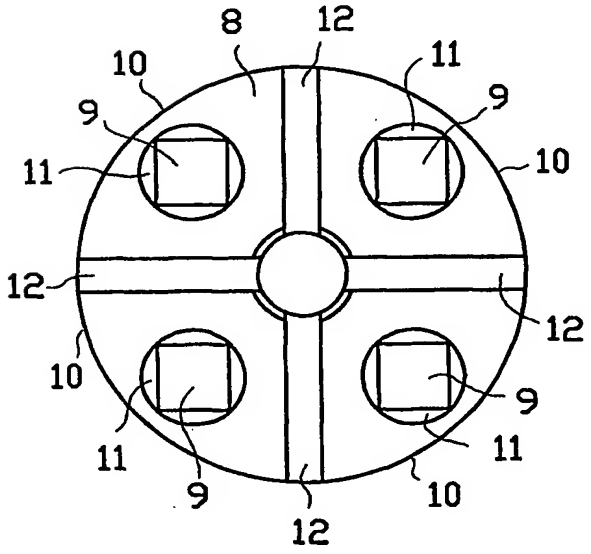

FIG. 8

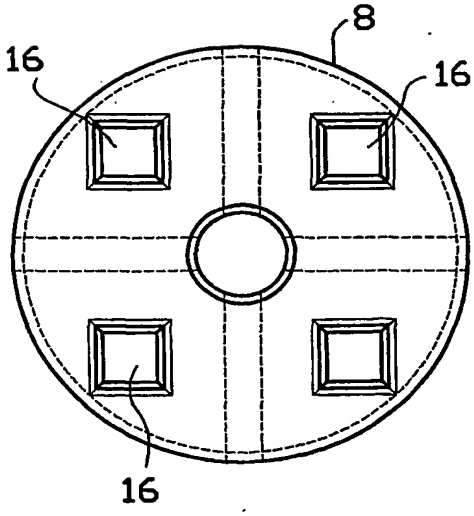

FIG. 9

INTERNATIONAL SEARCH REPORT

Inte nal Application No
PCT/NL 02/00085

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B01F15/04 F04C2/344 A22C11/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B01F F04C A22C B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 22206 A (VEMAG MASCHINEN UND ANLAGENBAU) 28 May 1998 (1998-05-28) cited in the application	1,4, 10-15
Y	page 3, line 9 - line 21 page 7, line 4 -page 10, line 10 figures 2-5B	2,3,5-9
Y	PATENT ABSTRACTS OF JAPAN vol. 009, no. 022 (M-354), 30 January 1985 (1985-01-30) -& JP 59 168291 A (NORITAKE KANPANII RIMITEDO:KK), 21 September 1984 (1984-09-21) abstract	2,3

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
13 June 2002	20/06/2002

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Int[illegible]pplication No
PCT/NL 02/00085

C.(Continuation) *DOCUMENTS CONSIDERED TO BE RELEVANT*

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 640 876 A (COZETTE RENE) 24 July 1928 (1928-07-24) the whole document	5-9
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A	US 4 622 717 A (BOLLINGER RUDOLF) 18 November 1986 (1986-11-18) figures 1-3	1-15

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In al Application No
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